

NON-PUBLIC?: N
ACCESSION #: 8907260021
LICENSEE EVENT REPORT (LER)

FACILITY NAME: MONTICELLO NUCLEAR GENERATING PLANT PAGE: 1 OF 8

DOCKET NUMBER: 05000263

TITLE: Reactor Low Level Scram Due to Reactor Feed Pump Discharge Check Valve Failure Resulting From Inadequate Inspection Criteria
EVENT DATE: 06/19/89 LER #: 89-009-00 REPORT DATE: 07/19/89

OPERATING MODE: N POWER LEVEL: 059

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: David R. Loberg, Engineer I TELEPHONE: (612) 295-1375

COMPONENT FAILURE DESCRIPTION:
CAUSE: D SYSTEM: SJ COMPONENT: V MANUFACTURER: H391
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

During the shutdown of a Reactor Feed Pump (RFP), the discharge check valve, FW 67-2, failed to seat. This provided a recirculation path for the operating

RFP and caused reactor water level to decrease to the SCRAM set point. Reactor water level was restored with the operating RFP and normal procedures were used to recover from the scram.

Excessive component wear which would allow the top of the valve disc to wedge under the lip of the seating surface is presumed to be the failure mode. If excessive clearances had been recognized during a 1987 inspection of FW 67-2, repairs could have prevented this event. The root cause of this event was inadequate acceptance criteria for valve inspection.

Check valve parts were replaced or rebuilt. Other similar valves were tested.

The RFP shut down procedure was changed to include closing the RFP discharge

valve to help assure no back flow through the pump. Future actions include developing acceptance criteria for check valve inspections, minimizing operation at critical system flow rates, and investigating a check valve modification.

END OF ABSTRACT

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DESCRIPTION

During end of cycle coast down, at 59 % power, the #12 Reactor Feed Pump (RFP) (P) was operating near its minimum flow set point. It was therefore decided to remove #12 RFP from service to avoid, pump minimum flow recirculation to the condenser (COND). The pump was tripped at 09:22 on June 19, 1989. After the pump was tripped, the control room operators observed a decrease in reactor (RCT) water level. Operators attempted to restart the tripped pump to help restore water level. The pump automatically tripped on over current. A plant scram, due to low reactor water level, was automatically initiated 45 seconds after the pump was initially tripped. Within 5 seconds of the scram, reactor water level began to increase. Reactor

water level was restored to it's normal level, with the #11 RFP, at approximately 09:36. Normal post scram procedures were followed without incident. All systems involved in the event were considered operable.

At approximately 09:40, it was deduced that the #12 RFP discharge check valve,

FW 67-2, had failed. This was verified by checking the rotation of the #12 RFP, which was rotating in the reverse direction. The check valve failure provided an alternate flow path through the feedwater (SJ) cross tie, back through #12 RFP, and through the condensate cross tie to the suction of #11 RFP. #12 RFP discharge manual isolation valve, FW 68-2, was closed at approximately 09:42 to prevent back flow through the pump. While closing the manual valve a loud noise was heard which was caused by FW 67-2 (check valve) going closed. FW 67-2 last operated properly on 2/19/89. This was the last time the #12 RFP was shut down while #11 RFP was running.

An INPO team was sent to the plant to investigate the event. The team indicated that they will not issue a separate SER for this event.

CAUSE

FW 67-2 was opened and inspected. The valve was found in the fully closed position. Grooves were worn into the valve body where the disc comes in contact with the body. The valve manufacturer indicated that they have

experienced discs being wedged into the upper portion of the valve body. Attempts to manually lodge the disc into the valve body grooves to confirm this possibility were unsuccessful. It was therefore concluded that this is a possible but unlikely failure mode.

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While stroking the valve manually, engineering and maintenance personnel were able to lodge the disc partially open with the top of the disc in the valve seat and an approximately 4 1/2" opening at the disc bottom. This is believed to be the most likely failure mode. FW 67-2 was disassembled completely for further inspection which revealed excessive clearance between the disc pin and the hinge arm hole. Also the hinge pin was worn to below manufacturer's specifications and the anti-rotation pin was broken. Please see the attached figures illustrating the possible failure modes and as found conditions.

The cause of the scram was the failure of FW 67-2 to check properly which resulted in low reactor water level. This check valve is close to the RFP and attached to an elbow which causes turbulence at the valve. Because of the turbulence, its length of service (18 years), and operation in the critical velocity range during reduced power operation, this valve experienced excessive wear.

This valve was inspected during the 1987 refueling outage by maintenance and engineering personnel. The inspection was done in response to IEIN 86-001, Feedwater Check Valve Failure. An operability check was made at that time to verify proper operation. No dimensional checks were made. It was noted at that time that some valve body wear was evident but it was considered acceptable and no action was recommended. Inspection personnel were aware that the valve was designed for some freedom of movement between valve parts and considered the existing clearances acceptable.

Comparing photographs taken of the valve in 1987 to photographs taken on June 20, 1989, it is evident that valve conditions did not change significantly. This event could have been avoided if acceptance criteria had been defined for the inspection conducted during the 1987 outage. The root cause of this event was inadequate acceptance criteria for valve inspection.

ANALYSIS

The significance of this event is that it caused a transient which resulted in a reactor scram. The feedwater system was able to maintain reactor water level above ECCS set points. RFP suction pressure never exceeded design

pressure during this event. All ECCS systems were available to provide cooling to the reactor vessel if needed.

Prior to resuming operation, a review of operational effects on feedwater check valves during low flow operation was completed. This was done to demonstrate the acceptability of continued plant operation.

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This event could have happened after an automatic RFP trip while at 100% power. Reactor level may have decreased more rapidly but it would not have affected the scram or changed any of the conditions following the reactor scram and therefore would not have posed a greater threat to public safety.

CORRECTIVE ACTION

The disc pin was restored to within manufacturer's specifications, the hinge pin and the anti rotation pin were replaced, and the valve body wear locations were weld overlaid to prevent the possibility of the disc lodging in the upper portion of the body. A change was incorporated in the system operating procedures which instructs the operator to close the feedwater discharge manual valves, FW 68-1 & 2, when a RFP is taken out of service.

The check valve maintenance program will be reviewed in light of this event and any necessary improvements will be made. Appropriate check valve acceptance criteria are being developed. The velocity range which is considered critical for check valve flutter and minimizing operation in this range is being determined. Operating procedures will be reviewed and revised as needed to minimize operation in the critical range.

To assure that other check valves were operable, inspections were conducted on 3 similar valves. This included the #11 RFP discharge check valve, FW 67-1, feedwater check valve, FW 91-1, and feedwater check valve, FW 91-2. The valve body of FW 67-1 was found worn and the hinge pin was slightly outside of manufacturer's specification. The valve body was repaired and the hinge pin was replaced. FW 91-1 and FW 91-2 were inspected and found to be in good condition. Four other feedwater check valves, feedwater outboard containment isolation check valves, FW 94-1 and FW 94-2, feedwater inboard containment isolation check valves, FW 97-1 and FW 97-2, and two reactor water clean up check valves, RC 6-1, and RC 6-2, were tested for leakage. The four feedwater check valves and one reactor water clean up valve passed the acceptance criteria of the leak test, while one reactor water clean up valve, RC 6-1, did not. LER 89-011 is being prepared to address this aspect of the event. Please see the attached figure of the feedwater system showing the valves that were inspected or tested.

To assure that the #12 RFP and motor were not damaged during the event the #12 RFP bearings were exposed and the motor end bell housings were removed for inspection. The bearings were found in good condition. Some evidence of overheating was found during the motor inspection but it was determined that this would have no effect on motor operation. The motor was meggered and the results were satisfactory. Vibration was monitored closely when the #12 RFP was put in service. Pump and motor vibration were satisfactory.

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Potential harmful effects resulting from the runout conditions experienced during this event were considered. On the basis of discussions with the original pump and motor manufacturers, and review of pump and motor protective

controls, it was determined that there were no harmful effects caused by the runout condition.

ADDITIONAL INFORMATION

Failed Component Identification

FW 67-2 is an Anchor Darling 14" 900# Swing Check Valve Anchor Darling drawing #2279-5.

Previous Similar Events

None

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Figure "SIMPLIFIED P & ID OF FW SYSTEM" omitted.

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Figure "FEEDWATER CHECK VALVE FAILURE MODES" omitted.

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Figure Omitted.

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Northern states Power Company

414 Nicollet Mall
Minneapolis, Minnesota 55401-1927

Telephone (612) 330-5500

July 19, 1989

Report Required by 10 CFR Part 50, Section 50.73

US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington DC 20555

MONTICELLO NUCLEAR GENERATING PLANT

Docket No. 50-263
License No. DPR-22
Reactor Low Level Scram Due to Reactor Feed Pump Discharge Check Valve Failure

Resulting From Inadequate on Criteria

The Licensee Event Report for this occurrence is attached. This event was reported via the Emergency Notification System per 10 CFR Part 72 on June 19, 1989.

Thomas M Parker
Manager Nuclear Support Services

c: Regional Administrator-III, NRC
NRR Project Manager, NRC
Resident Inspector, NRC
MPCA
Attn: J W Ferman

Attachment: LER 89-009

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